GUIDE TO THE

FORTY-FIFTH ANNUAL FIELD CONFERENCE

of the

SECTION OF GEOLOGY

of the

OHIO ACADEMY OF SCIENCE

April 18, 1970

CINCINNATIAN STRATA FROM OREGONIA TO THE OHIO RIVER

With notes on Pleistocene geology along the route
(Warren and Clermont Counties)

Vice President, Section C
William F. Jenks
The University of Cincinnati

45th Annual Meeting
Wittenberg University
Floyd Nave, Chairman,
Dept. of Geology

Guidebook Committee
K. E. Caster University
R. H. Durrell of
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INTRODUCTION

The purpose of this trip is to examine a number of the classic localities of the Cincinnatian from the Waynesville and Arnheim in the Richmond down through the Maysville and Eden to the Point Pleasant, just below the Eden in the Cynthiana (see the Geologic Map, Fig. 1).

Desirable as it might be, we have not attempted to fit the older biostratigraphic subdivisions of the Upper Ordovician with the lithostratigraphic units erected, chiefly in Indiana, since 1955. It seems most reasonable to consider the macrofaunal assemblages as part of the evidence for the distinction of locally mappable stratigraphic units. Thus the biostratigraphic units worked out by Foerste, Shideler and others before 1915 are, at least locally, mappable units. Their general correlations with the Indiana section is shown in Figure 3, and the detailed formations, members and faunal zones are shown in Figures 4 and 5 (from Caster, Dalve and Pope, 1961).

The whole field trip is along the axis of the Cincinnati Arch. The drop from basal Richmond beds down to sub-Eden is almost entirely due to drop in elevation rather than to any dip of these almost flat-lying beds.

The route of the excursion southward from Fort Ancient will traverse the Illinoian till plains which have been little dissected except near the Ohio River (see Fig. 2). Stone counts, fabric, and fluted till plains (Hamilton Township, southern Warren County) indicate that the area traversed by the route was overriden by the Clermont Lobe of the Illinoian Sheet. This lobe covered a larger area than the Wisconsin Scioto lobe, extending to and slightly beyond the Ohio River. The Ohio developed in its present course east of Cincinnati prior to the Illinoian advance.

Goldthwait (1968) indicates that a silt cover has been recognized capping the soils of southwestern Ohio for three-quarters of a century. Figure 2-a shows the greatest thickness in the interlobate area between the Cuba and Hartwell moraines. This is a loess shadow from the Little Miami River immediately to the west. Its loess shadow is greater than the Great Miami River to the west because during early Wisconsin time the Little Miami drained twice the area it has today (Goldthwait, 1959). Dates available suggest a 17-19,000 BP age for some of these loesses.

The field trip will assemble at Fort Ancient State Memorial, in the parking lot in front of the Museum, at 8:30 AM. From Middletown go south on US 68 to Interstate 71 and SW on I-71 to the Lebanon exit, State Route 123. Turn east on State Route 350 just SE of the interstate. Fort Ancient is about 3½ miles to the east, on the south side of the highway.

Fort Ancient is a Hopewell Indian site (300 BC - 600 AD), 275' above the Little Miami River. There are three main enclosures surrounded by dirt walls four to 23 feet high. Archaeological studies have shown that the site was in large part ceremonial; pottery, tools and ornaments have been discovered.

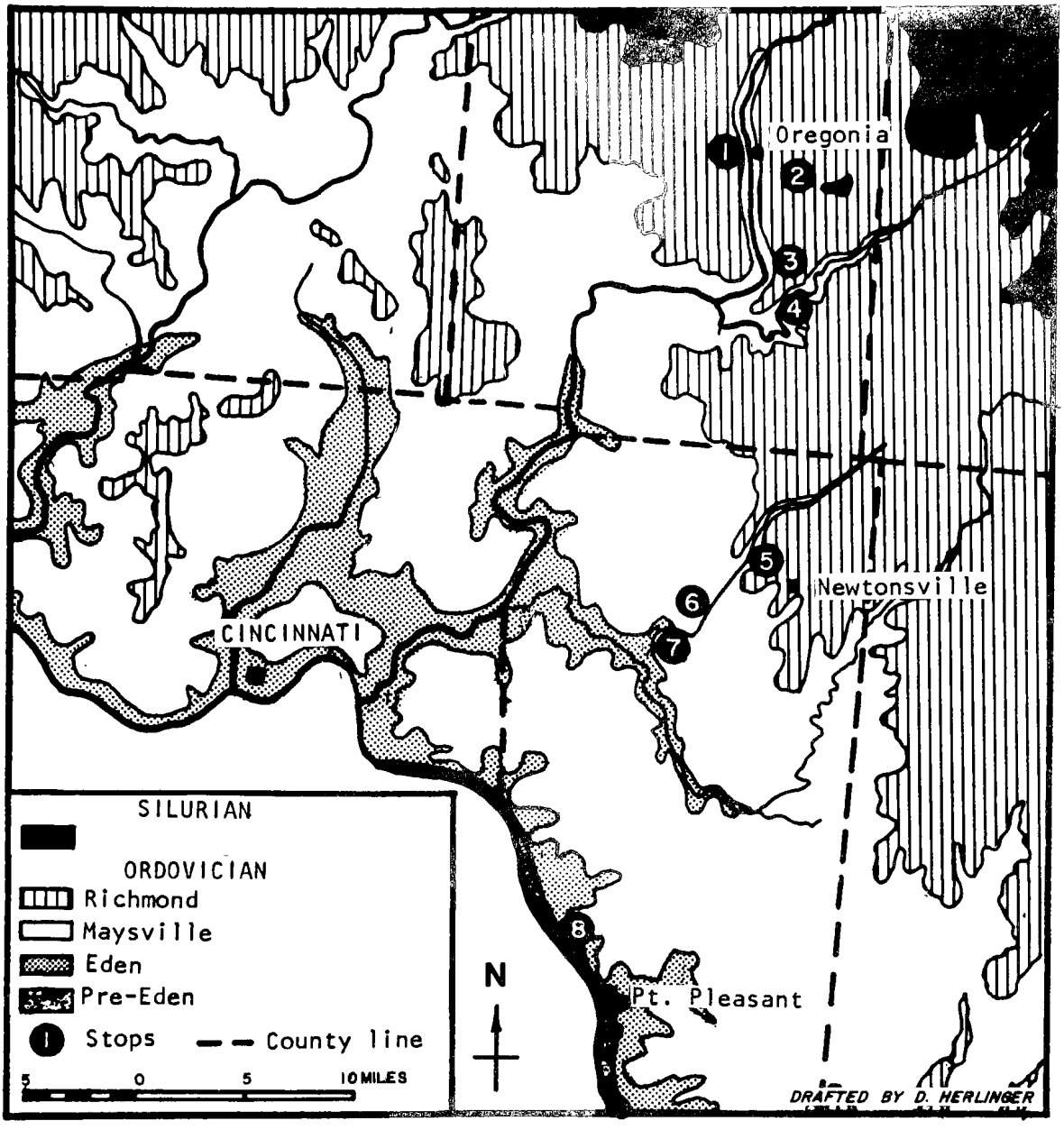


Figure 1 Geologic map showing 1970 field trip stops.

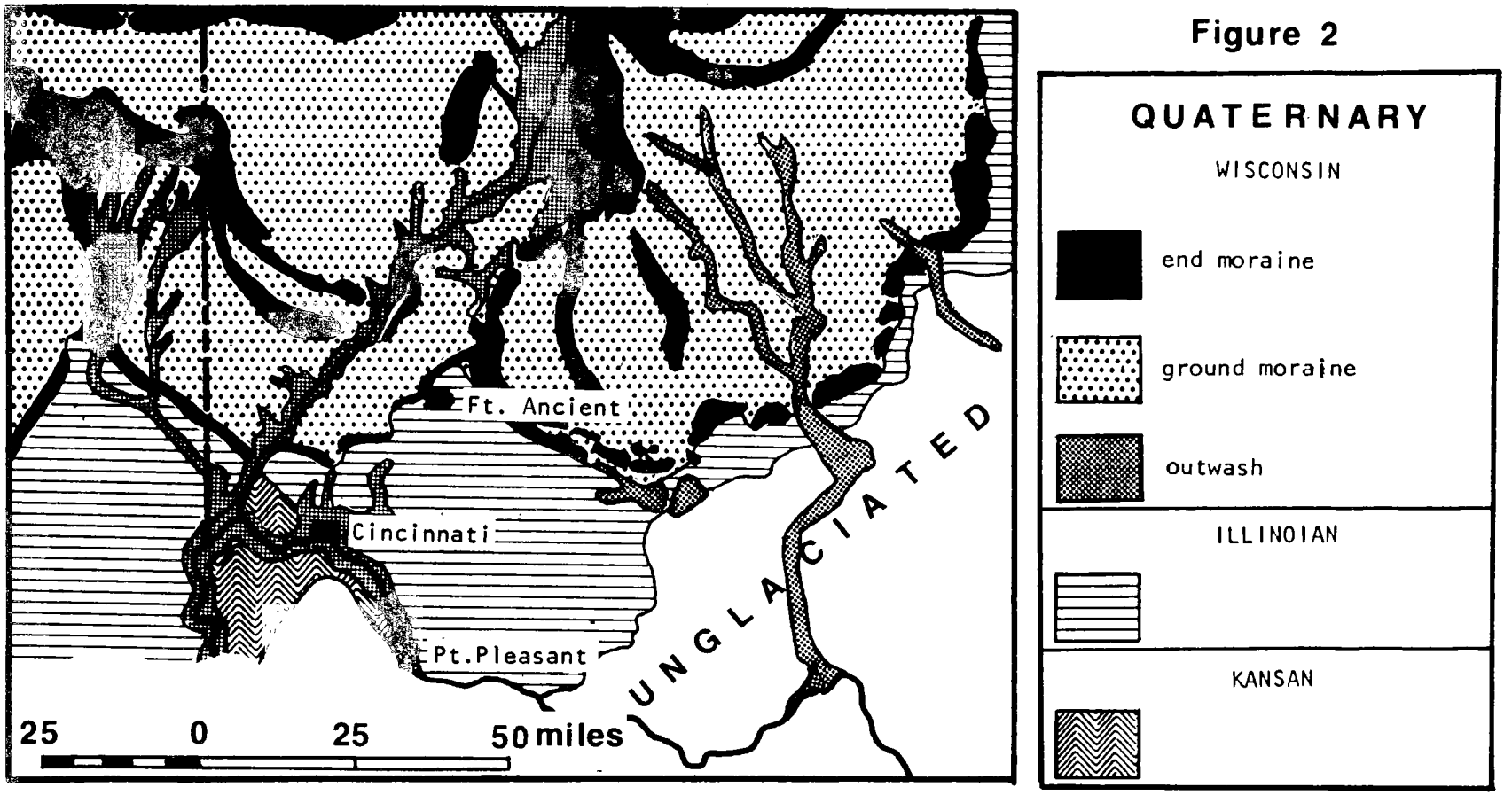


Figure 2

SURFICIAL GEOLOGY

(FROM G.S.A. GLACIAL MAP)

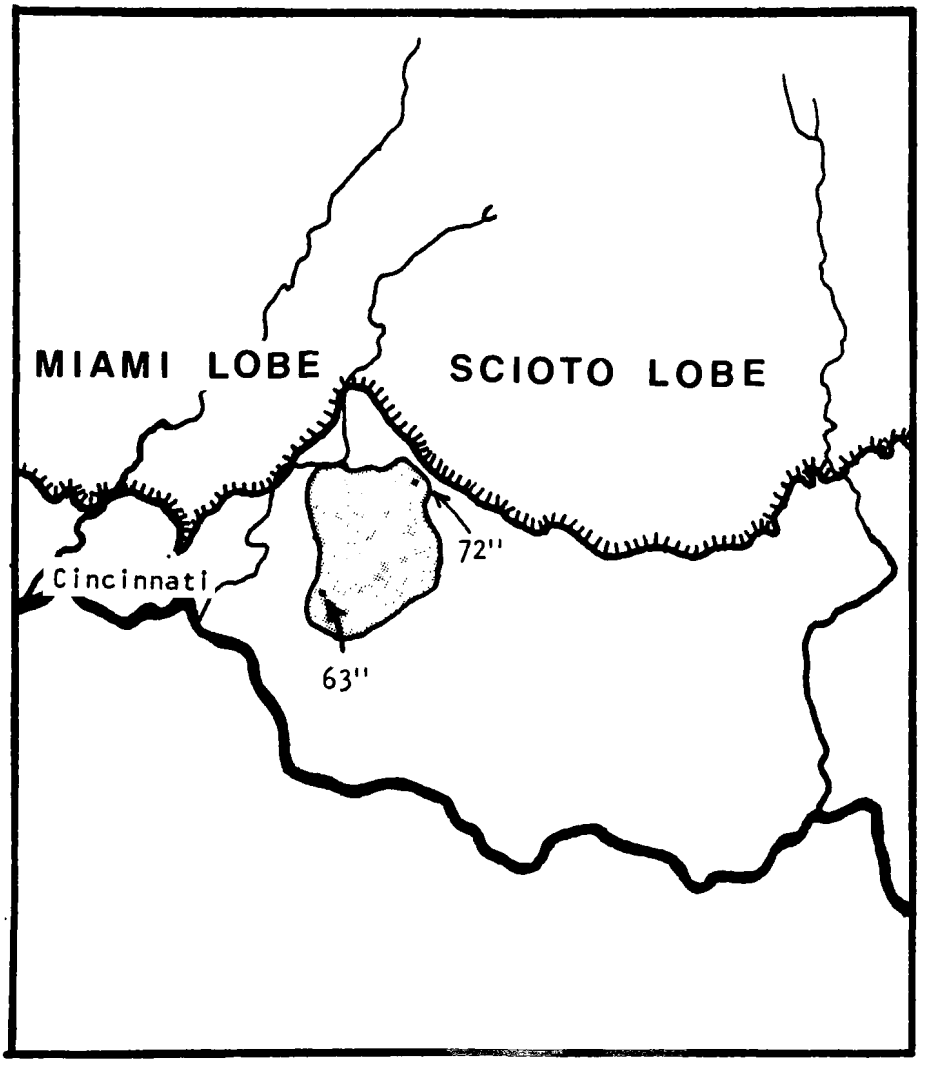


Figure 2a Shaded area depth of loess more than 50 inches

PATTON, PERRY AND WAYNE, 1953		BROWN AND LINEBACK, 1966
Group	Formation	Formation
Richmond	Elkhorn Whitewater	Whitewater
	Saluda	Saluda
	Liberty Waynesville	Dillsboro
Maysville	Arnheim Mount Auburn Corryville Bellevue Fairmount Mount Hope	
Eden	McMicken Southgate Economy	Kope

Fig. 3. Subdivision of Cincinnatian Series in SE Indiana as proposed by Brown and Lineback (1966), as compared with the previously accepted nomenclature in SW Ohio and SE Indiana.

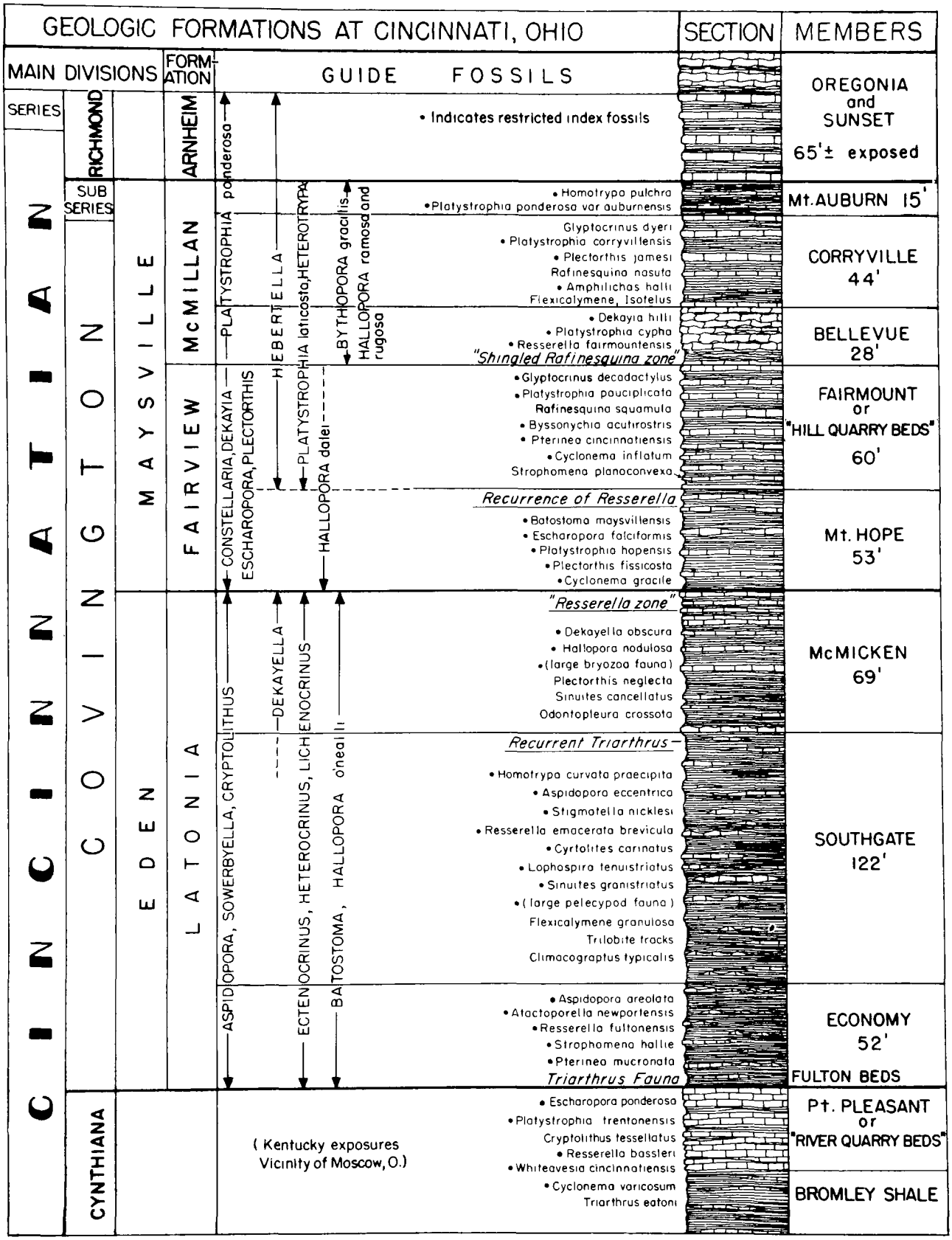

GEOLOGIC FORMATIONS AT CINCINNATI, OHIO
MAIN DIVISIONS
SERIES
FORMATION
GUIDE FOSSILS
SECTION
MEMBERS
CINCINNATIAN
RICHMOND
ARNHEIM
• Indicates restricted index fossils
OREGONIA and SUNSET 65'± exposed
SUB SERIES
EDEN
MAYSVILLE
McMILLAN
PLATYSTROPHIA ponderosa
• Homotrypa pulchra
• Platystrophia ponderosa var auburnensis
Mt. AUBURN 15'
Glyptocrinus dyeri
• Platystrophia corryvillensis
• Plectorthis jamesi
Rafinesquina nasuta
• Amphilichas halli
Flexicalymene, Isotelus
CORRYVILLE 44'
HEBERTELLA
PLATYSTROPHIA laticosta, HETEROTRYPA
BYTHOPORA gracilis
HALLOPORA ramosa and rugosa
• Dekayia hilli
• Platystrophia cypha
• Resserella fairmountensis
"Shingled Rafinesquina zone"
BELLEVUE 28'
COVINGTON
FAIRVIEW
CONSTELLARIA, DEKAYIA
ESCHAROPORA, PLECTORTHIS
PLATYSTROPHIA dalei
HALLOPORA dalei
• Glyptocrinus decadactylus
• Platystrophia pauciplicata
Rafinesquina squamula
• Byssonychia acutirostris
• Pterinea cincinnatiensis
• Cyclonema inflatum
Strophomena planoconvexa
FAIRMOUNT or "HILL QUARRY BEDS" 60'
Recurrence of Resserella
• Batostoma maysvillensis
• Escharopora falciformis
• Platystrophia hopensis
• Plectorthis fissicosta
• Cyclonema gracile
Mt. HOPE 53'
LATONIA
CRYPTOLITHUS
DEKAYELLA
LICHENOCRINUS
HALLOPORA oneali
"Resserella zone"
• Dekayella obscura
• Hallopora nodulosa
• (large bryozoa fauna)
Plectorthis neglecta
Sinuites cancellatus
Odontopleura crassota
McMICKEN 69'
Recurrent Triarthrus
• Homotrypa curvata praecipita
• Aspidopora eccentrica
• Stigmatella nicklesi
• Resserella emacerata brevicula
• Cyrtolites carinatus
• Lophospira tenuistriatus
• Sinuites granistriatus
• (large pelecypod fauna)
Flexicalymene granulosa
Trilobite tracks
Climacograptus typicalis
SOUTHGATE 122'
ASPIDOPORA, SOWERBYELLA, CRYPTOLITHUS
ECTENOCRINUS, HETEROCRINUS, LICHENOCRINUS
BATOSTOMA, HALLOPORA oneali
• Aspidopora areolata
• Atactoporella newportensis
• Resserella fultonensis
• Strophomena hallie
• Pterinea mucronata
Triarthrus Fauna
ECONOMY 52'
FULTON BEDS
CYNTHIANA
(Kentucky exposures Vicinity of Moscow, O.)
• Escharopora ponderosa
• Platystrophia trentonensis
Cryptolithus tessellatus
• Resserella basleri
• Whiteavesia cincinnatiensis
• Cyclonema varicosum
Triarthrus eatoni
Pt. PLEASANT or "RIVER QUARRY BEDS"
BROMLEY SHALE

Figure 4

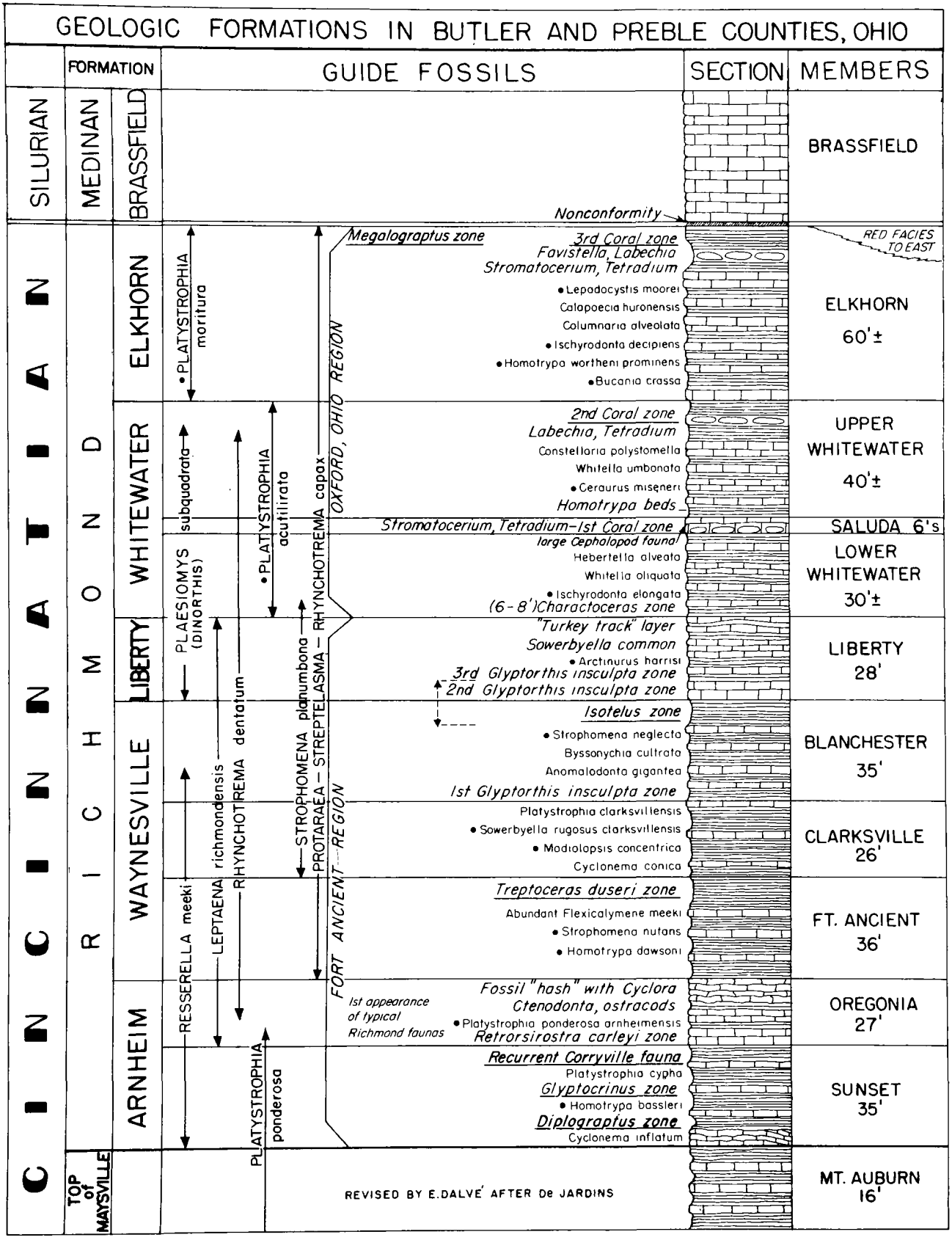
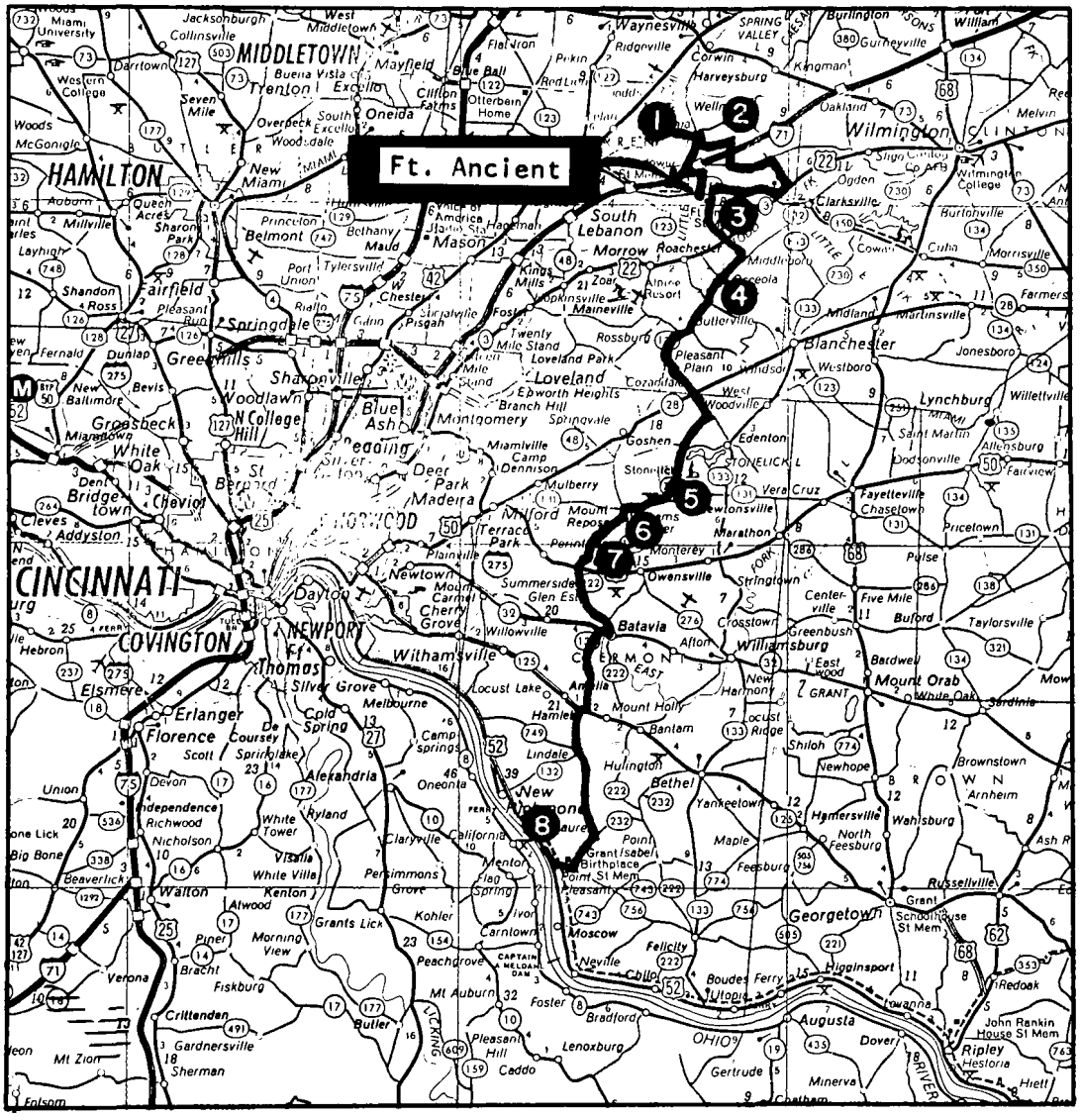

GEOLOGIC FORMATIONS IN BUTLER AND PREBLE COUNTIES, OHIO
FORMATION
GUIDE FOSSILS
SECTION
MEMBERS
SILURIAN
MEDINAN
BRASSFIELD
CINCINNATIAN
RICHMOND
ELKHORN
WHITEWATER
LIBERTY
WAYNESVILLE
ARNHEIM
TOP of MAYSVILLE
BRASSFIELD
Nonconformity
RED FACIES TO EAST
ELKHORN 60'±
UPPER WHITEWATER 40'±
SALUDA 6's
LOWER WHITEWATER 30'±
LIBERTY 28'
BLANCHESTER 35'
CLARKSVILLE 26'
FT. ANCIENT 36'
OREGONIA 27'
SUNSET 35'
MT. AUBURN 16'
OXFORD, OHIO REGION
FORT ANCIENT—REGION
Megalograptus zone
3rd Coral zone
Favistella, Labechia
Stromatocerium, Tetradium
• Lepadocystis moorei
Calapoecia huronensis
Columnaria alveolata
• Ischyrodonta decipiens
• Homotrypa wortheni prominens
• Bucania crassa
2nd Coral zone
Labechia, Tetradium
Constellaria polystomella
Whitella umbonata
• Ceraurus miseneri
Homotrypa beds
Stromatocerium, Tetradium—1st Coral zone
large Cephalopod fauna
Hebertella alveata
Whitella oliquata
• Ischyrodonta elongata
(6-8')Charactoceras zone
"Turkey track" layer
Sowerbyella common
• Arctinurus harrisi
3rd Glyptorthis insculpta zone
2nd Glyptorthis insculpta zone
Isotelus zone
• Strophomena neglecta
Byssonychia cultrata
Anomalodonta gigantea
1st Glyptorthis insculpta zone
Platystrophia clarksvillensis
• Sowerbyella rugosus clarksvillensis
• Modiolopsis concentrica
Cyclonema conica
Treptoceras duseri zone
Abundant Flexicalymene meeki
• Strophomena nutans
• Homotrypa dawsoni
1st appearance of typical Richmond faunas
Fossil "hash" with Cyclora
Ctenodonta, ostracods
• Platystrophia ponderosa arnheimensis
Retrorsirostra carleyi zone
Recurrent Corryville fauna
Platystrophia cypha
Glyptocrinus zone
• Homotrypa bassleri
Diplograptus zone
Cyclonema inflatum
• PLATYSTROPHIA moritura
subquadrata
• PLATYSTROPHIA acutilirata
PLAESIOMYS (DINORTHIS)
RESSERELLA meeki
LEPTAENA richmondensis
RHYNCHOTREMA dentatum
PLATYSTROPHIA ponderosa
RHYNCHOTREMA capax
STROPHOMENA planumbona
PROTARAEA—STREPTELASMA
REVISED BY E.DALVE' AFTER De JARDINS

Figure 5


Ft. Ancient
1
2
3
4
5
6
7
8
MIDDLETOWN
HAMILTON
CINCINNATI
COVINGTON
NEWPORT
Wilmington
Blanchester
Georgetown
Augusta
Batavia
Loveland
Springdale
Greenhills
Sharonville
Woodlawn
Blue Ash
Madeira
Deer Park
Norwood
Mariemont
Terrace Park
Milford
Withamsville
Newtown
Owensville
Williamsburg
Mount Orab
Hillsboro
Lynchburg
Wilmington
Clarksville
Midland
Martinsville
Fayetteville
Chesterville
Pricetown
Pulse
Buford
Taylorsville
Russellville
Ripley
Higginsport
Aberdeen
Maysville
Dover
Minerva
Gertrude
Neville
Moscow
Felicity
Bethel
Hulington
Locust Ridge
Shiloh
Newhope
Brownstown
Arnheim
Wahsburg
Hamersville
Feesburg
Maple
Point Isabel
Point St Mem
Grant/Isabel
Birthplace
Pleasant
Flag Spring
Mentor
California
Claryville
Persimmons Grove
White Villa
Vitalia
White Tower
Ryland
Alexandria
Oneonta
New Richmond
Locust Lake
Melbourne
Silver Grove
Cold Spring
Camp Springs
Lindale
Amelia
Mount Holly
Bantam
Hamer
Harmony
Locust
Afton
Crosstown
Greenbush
Center-ville
Five Mile
Stringtown
Fork
Monterey
Marathon
Vera Cruz
Stonelick
Edenton
Goshen
Miamiville
Camp Dennison
Mulberry
Mount Repose
Plainville
Summerside
Glen Este
Cherry Grove
Willowville
Newtown
Mount Carmel
Terrace Park
Branch Hill
Loveland Park
Twenty Mile Stand
Rossburg
Pleasant Plain
Westboro
West Woodville
Windsor
Corwin
Harveysburg
Waynesville
Ridgeville
Flat Iron
Blue Ball
Otterbein Home
Clifton Falls
Oneida
Overpeck
South Excello
Woodsdale
Trenton
Buena Vista
Excello
Mayfield
Darrtown
Western College
Seven Mile
Woods
McGonigle
New Miami
Quech
Acres
Sharon Park
Millville
Aubourn
Belmont
Princeton
Bethany
Maud
Port Union
Tylersville
Chester
Riddle
Pisgah
Mason
Haddonah
South Lebanon
Morrow
Roachester
Kings Mills
Zoar
Opkinsville
Maineville
Butlerville
Middleboro
Osceola
Ogden
Sligo
Cowan
Cuba
Morrisville
Burlington
Gurneyville
Oakland
Kingman
Fairfield
Shandon
Ross
Pleasant Run
Springdale
Fernald
Dunlap
Bevis
New Baltimore
Greenhills
Sharonville
Woodlawn
N College Hill
Groesbeck
White Oak
Miamitown
Dent
Bridgetown
Cheviot
Cleves
Addyston
Hebron
Elsmere
Erlanger
Florence
Scott
Devon
Union
Independence
Richwood
Nicholson
Big Bone
Beaverlick
Walton
Verona
Piner
Bracht
Fiskburg
Crittenden
Gardnersville
Sherman
Mt Zion
Folsom
Alwood
Kenton
Grants Lick
Morning View
Kohler
Carntown
Peachgrove
Mt Auburn
Foster
Bradford
Pleasant Hill
Caddo
Lenoxburg
Butler
Vicinity
Captain Meldahl Dam
Boudes Ferry
Utopia
Towanna
John Rankin House St Mem
Redoak
Grant
School House
St Mem
Russellville
Brownstown
Arnheim
Wahsburg
Hamersville
North

This famous Hopewell site is located on the bluff on the east side of the N-S bedrock gorge of the Little Miami River. It is in an interlobate area on Illinoian till between the Wisconsin Miami lobe to the northwest and the Scioto lobe to the northeast. This narrow valley, over 250 feet in depth, is one of a number in the Little Miami drainage basin due to glacial diversion. This bedrock gorge was formed by the diversion of a SE-NW flowing stream (Morrow to South Lebanon on to Middletown) by the snout of the Wisconsin Miami lobe.

The "Anderson Village Site" in the Little Miami Valley is much later (1000 - 1600 AD).

The caravan will leave the Fort Ancient parking lot at 8:50 AM.

ROAD LOG
(Route is shown on Fig. 6)

Mileage		
0.1	0.1	Right on Route 350 (Oregonia quad.)
0.7	0.8	Turn left on Middleboro Road
2.0	2.8	Turn left on Wilmington Road; cross Interstate 71
1.7	4.5	Leave Wilmington Road; continue straight ahead on road following east bank of Little Miami River. Note Illinoian till terraces along this valley. Wisconsin outwash gravels are present also.
1.4	5.9	Oregonia. Cross railroad and Little Miami River, bearing left on Oregonia Road.
0.7	6.6	STOP 1. 30 minutes. Hawley's Run section of the upper Arnheim and lower Waynesville.

This series of exposures along the creek seems to include the part of Wolford's (1930) section reproduced below, in large part based on earlier work by Foerste and Shideler. The Rafinesquina shell-bank bed in the lower part of the presently exposed section may be at about the level of bed 3. For micropaleontologists, this section appears to be about 1/3 above the base of the conodont section 11 of Kohut and Sweet (1968). Waynesville strata are exposed intermittently upstream, with trilobite bearing layers (possibly bed 11 of the following section) about 0.7 mile upstream. (Participants who feel that this is their lucky day for trilobites may drive the 0.7 mile upstream. Limited parking space opposite shacks. Remember, this is only a 30 minute stop.)

Modified from Wolford's Section at Oregonia (1930):

RICHMOND GROUP
Waynesville Formation
Clarksville Member

11. Fine-grained, even-bedded, blue shale commonly referred to as the Trilobite Beds because of the relative abundance of Treptoceras duseri and Flexicalymene meeki at this horizon. Other fossils common to the zone are: fragments of Isotelus, several species of pelecypods, Cyphotrypa clarksvillensis, Tetradium huronense (?), and Stromatocerium huronse (?). 5'5"

(This zone was formerly classified with the Ft. Ancient member, but Dr. Shideler advised Wolford that it is Clarksville because of the existence therein of Tetradium and Stromatocerium-Richmond forms not present in the Ft. Ancient member.)

Ft. Ancient member..... 36'8"

Most completely represented in Blacksmith Hollow, Longstreth Branch and Stony Run.

10. Alternating shale and thin limestone layers containing principally Rafinesquina alternata and Resserella meeki.... 3'0"

9. Even-bedded, blue shale with thin limestone partings. Base of zone marked by a three-inch, wave-marked limestone layer. Most abundant fossils are: Pterinea demissa, Modiolopsis concentrica, Byssonychia radiata, Anomalodonta gigantea, A. alata, Zygospira modesta, Rafinesquina alternata and Resserella meeki..... 8'0"

8. Blue shale with a few thin limestone partings; fossils essentially the same as in zone above..... 8'8"

7. Zone of nodular shale and thin, argillaceous limestone layers, with a three-inch dense limestone layer at top of zone. Fossils jumbled and broken..... 3'6"

Rafinesquina alternata and Resserella meeki predominate in number, almost to the exclusion of other forms.

6. Alternating layers of irregularly-bedded, argillaceous limestone and nodular, blue shale containing principally jumbled and broken specimens of Flexicalymene meeki, Cornulites sterlingensis (?), Zygospira modesta, Rafinesquina alternata and Resserella meeki..... 10'6"

5. Irregularly-bedded limestone layers with thin shale partings. Shale relatively barren of fossils, and limestone layers composed chiefly of fossil fragments and jumbled specimens of Resserella meeki..... 3'0"

Arnheim Formation:

Best exposed in Blacksmith Hollow and Longstreth Branch.

Oregonia member..... 23'9"

4. Conspicuous zone of nodular, irregularly-bedded, argillaceous limestone layers that weather into lumps. Fossil fragments are abundant throughout the zone, indicating shallow water conditions of deposition, but the only unbroken specimens found were a few Pterinea demissa, Anomalodonta gigantea, A. alata, Cornulites sterlingensis (?) and a single Strophomena concordensis..... 5'6"

3. Alternating layers of coarse-grained, irregularly-bedded limestone and nodular shale. Fossils include those of Zone 4, plus Cyclonema bilix, Rafinesquina alternata, Resserella meeki, Peronopora decipiens, Mesotrypa orbiculata, Homotrypa bassleri, Ceramoporella ohioensis, Batostoma varians and many microscopic pelecypods, gastropods, brachiopods and bryozoa, several of which are undescribed.. 12'8"

2. Zone of shale and limestone layers; top marked by even-bedded limestone layer with nodules of pyrite..... 1'2"

1. Retrorsirostra carleyi zone..... 4'5"

Thin layers of shale and limestone containing Retrorsirostra carleyi, Trematis millipunctata, Leptaena richmondensis, Stigmatella crenulata, Rhopalonaria venosa and Batostoma varians. The first appearance of the brachiopod Retrorsirostra carleyi marks the base of the Oregonia member. - (A. F. Foerste, Ohio Naturalist, XII, Jan. 1912, p. 436.)

Sunset member (Probably below level of Hawley's Run section)..... 35'0"

Base of Richmond Group

Turn around and return to Oregonia, going straight east to Corwin Road.

0.8 7.4 Right on Corwin Road

0.2 7.6 Left on Olive Branch Road

0.9 8.5 STOP 2. 40 minutes. Park on south side of road near wooden gate. Walk southwest about .3 mile to erratic slab of Brassfield limestone. See map, Fig. 7.

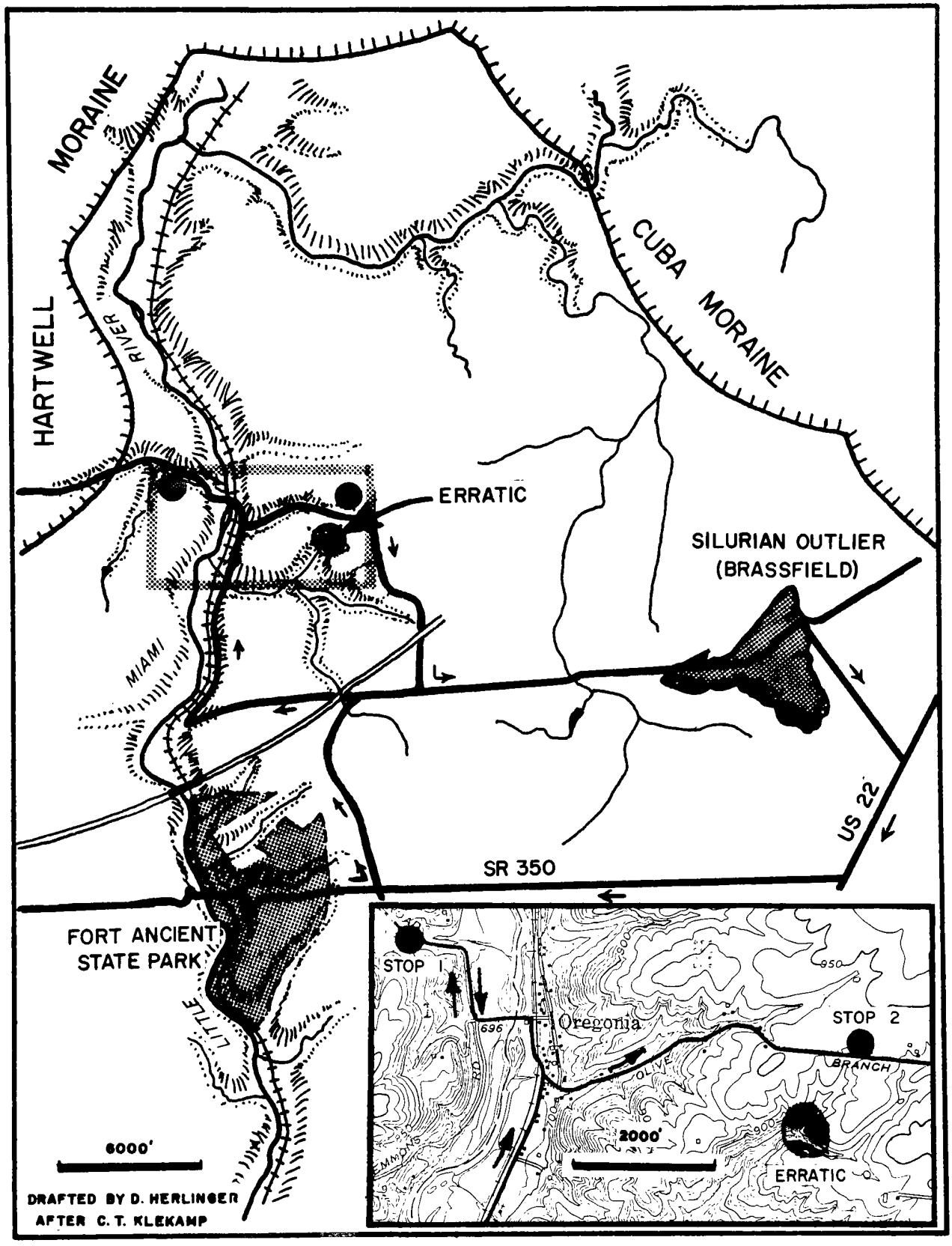


Figure 7. Maps taken from the U.S.G.S 7 1/2 minute Oregonia quadrangle locating the Hall's Creek section (stop 1), the erratic, and the Silurian outlier.

The Brassfield Erratic

This gently dipping large mass of Brassfield limestone overlies Illinoian till. It has been dissected by the tributaries of Olive Branch but its present distribution (2 large blocks north of the main tributary and smaller ones to the south) suggest a former size of 45,000 square feet. Its average thickness is approximately 5' with a maximum of 17'. The original erratic had a volume of at least 225,000 cubic feet with a weight of 13,500 tons. A small quarry was open in the erratic over 50 years ago. The main mass dips 15° to the southwest.

Stratigraphically it rests 125' below the Brassfield outcrops in a mesa 3.5 miles due east (Fig. 7 and Oregonia 7½" quadrangle). Small knobs of varicolored upper Richmond shales are located 0.5 miles E of the intersection of Murray and Wilmington roads. These beds are also exposed around the mesa.

This erratic was apparently moved southwest several miles from a possible outlier outcrop position to the northeast. It is hoped this area can be preserved as a natural area.

0.2 8.7 Murray Road. Turn right.

1.3 10.0 Cross I-71.

0.4 10.4 Left on Wilmington Road. Note two knobs of Richmond shale to left (north).

Continue east-junction of Wilmington Road and Kobel Road - ascent Silurian outlier (see map, Fig. 7).

Junction Wilmington and Clarksville Road - turn right (south) off mesa).

- poor outcrops of Brassfield and varicolored Richmond shale to right in fields.

- view to left (east) of Cuba moraine of Wisconsin in Scioto lobe. A large marginal lobe existed 18-19,000 years BP to the northeast of this mesa in front of the Cuba moraine.

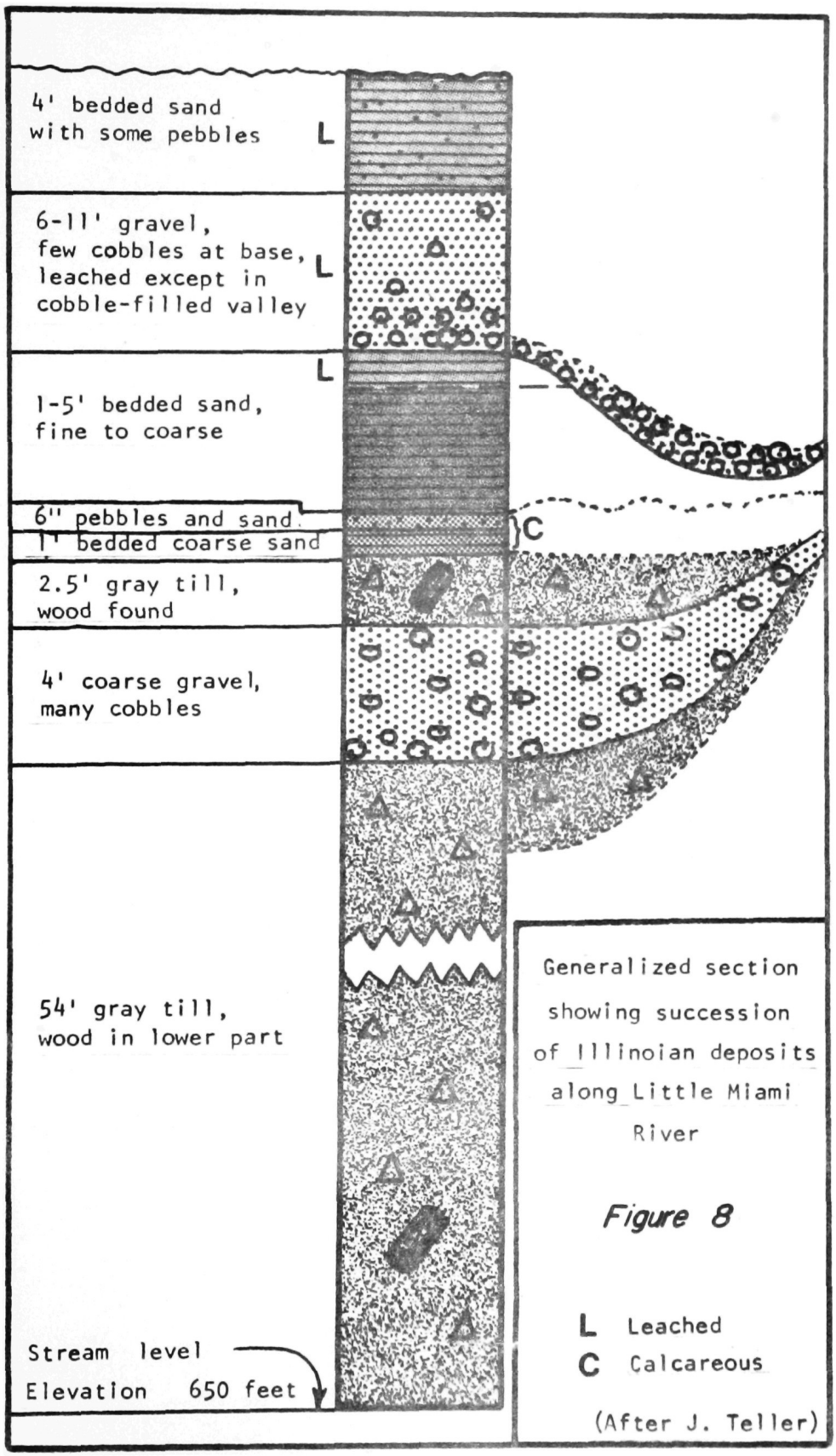
Mileage not included in log

Junction Ohio 3 and US 22 and Clarksville Road - Turn right.

Junction Ohio 3 and Ohio 350 - Turn right (west).

12.2 Middleboro Road. Turn left (south).

0.5	12.7	STOP 3. 30 minutes. Park just beyond concrete bridge across Stony Run. Waynesville "butter layer" trilobite beds made famous by Shideler, Cary Williams, Foerste, and many others. For many years the Waynesville "butter layer" (yellowish clay - shale bed) was the favorite collecting site of Flexicalymene meeki. When whiskey was 25¢ a shot there were bars in Lebanon where an enrolled Flexicalymene was good for a drink. Most of the "Calymenes" in museum collections around the world carrying the label "Cincinnati, Ohio" came from the Lebanon area.
		Continue south on Middleboro Road (Pleasant Plain quadrangle).
3.1	15.8	Crossing Todds Fork of Little Miami River.
1.3	17.1	Right on Route 132 in Middleboro.
2.1	19.2	Bridge across Lick Run. Platystrophia locality in Arnheim formation.
1.3	20.5	STOP 4. 20 minutes. Park on bridge across Second Creek and descend to creek on north side. Fossiliferous Lower Arnheim formation. A short distance downstream are megaripples and a small fold.
		Continue SW on Route 132.
2.9	23.4	Turn left on Pleasant Plain Road in Pleasant Plain.
		Route traverses typical poorly drained Illinoian till plains. Calcareous till is found 6-8 feet in depth commonly. Due to gentle sloping to flat terrain and the presence of a clay pan farming begins quite late and in general yields are half that in similar areas to the north in the Wisconsin.
1.6	25.1	Cross Route 28. Continue on Pleasant Plain - Edenton Road (Newtonsville quadrangle).
1.1	26.2	Stop Sign. Turn right.
0.1	36.3	Turn left on Pleasant Plain-Newtonville Road.
1.5	27.8	Junction with Route 727. South on 727 past the west end of Stonelick Lake.
		(Stonelick Lake covers rare Calazyga headi outcrops in middle Waynesville formation.)
3.8	31.6	Right on Route 131.
0.3	31.9	Roadside Park. Lunch stop. 45 minutes. After lunch turn E on 131.


4' bedded sand
with some pebbles
L
6-11' gravel,
few cobbles at base,
leached except in
cobble-filled valley
L
L
1-5' bedded sand,
fine to coarse
6" pebbles and sand
1' bedded coarse sand
C
2.5' gray till,
wood found
4' coarse gravel,
many cobbles
54' gray till,
wood in lower part
Stream level
Elevation 650 feet
Generalized section
showing succession
of Illinoian deposits
along Little Miami
River
Figure 8
L Leached
C Calcareous
(After J. Teller)

0.5	38.8	Right on Route 132.
2.2	41.0	Left on Stonelick-Williams Corner Road.
3.3	44.03	Covered bridge over Stonelick Creek.
0.2	44.5	STOP 7. 30 minutes. Park in yard and on old road by St. Philomena Church. Good outcrops of Eden in stream.

The Deep Stage valley of Stonelick Creek formerly drained southwest, but is now blocked by Illinoian glacial till. The valley bottom slopes to the west here as indicated by the lack of bedrock outcrops in small streams to the west.

Continue West.

0.4	44.9	Note broad Stonelick Valley, a continuation of the Deep Stage valley below the Illinoian blockage.
0.6	45.5	Left on U.S. 50. (Batavia quadrangle). The Cincinnati Nature Center is near Perintown, three miles to the west.
0.2	45.7	Right (south) on Route 222.
4.0	49.7	Right in Batavia on Route 132, which goes left immediately after crossing bridge over East Fork of the Little Miami River. Follow Route 132 to South.
1.4	51.1	Note Mt. Hope-McMicken beds in road cut, ascending from valley.
3.3	54.4	Junction with Route 125. Turn right.
0.3	54.7	Left on Route 132.
2.0	56.7	Left on Route 749 (Lindale-Nicholsville Road).
1.0	57.7	Right on Laurel-Lindale Road.
5.0	62.7	Right on Route 232 in Laurel.
1.6	64.3	Note fine exposure of large ripple marks in Southgate beds of lower Eden (Kope) in Indian Creek.
1.7	66.0	Point Pleasant (Birthplace of U. S. Grant). Junction with U.S. 52. Turn right.
0.5	66.5	Old "River Quarries" in Point Pleasant limestone.
2.6	69.1	Turn right on Clermont-Laurel Road.
0.2	69.3	STOP 8. 30 minutes. Boat Run. Point Pleasant limestone with fine slump structures, megaripples, etc.

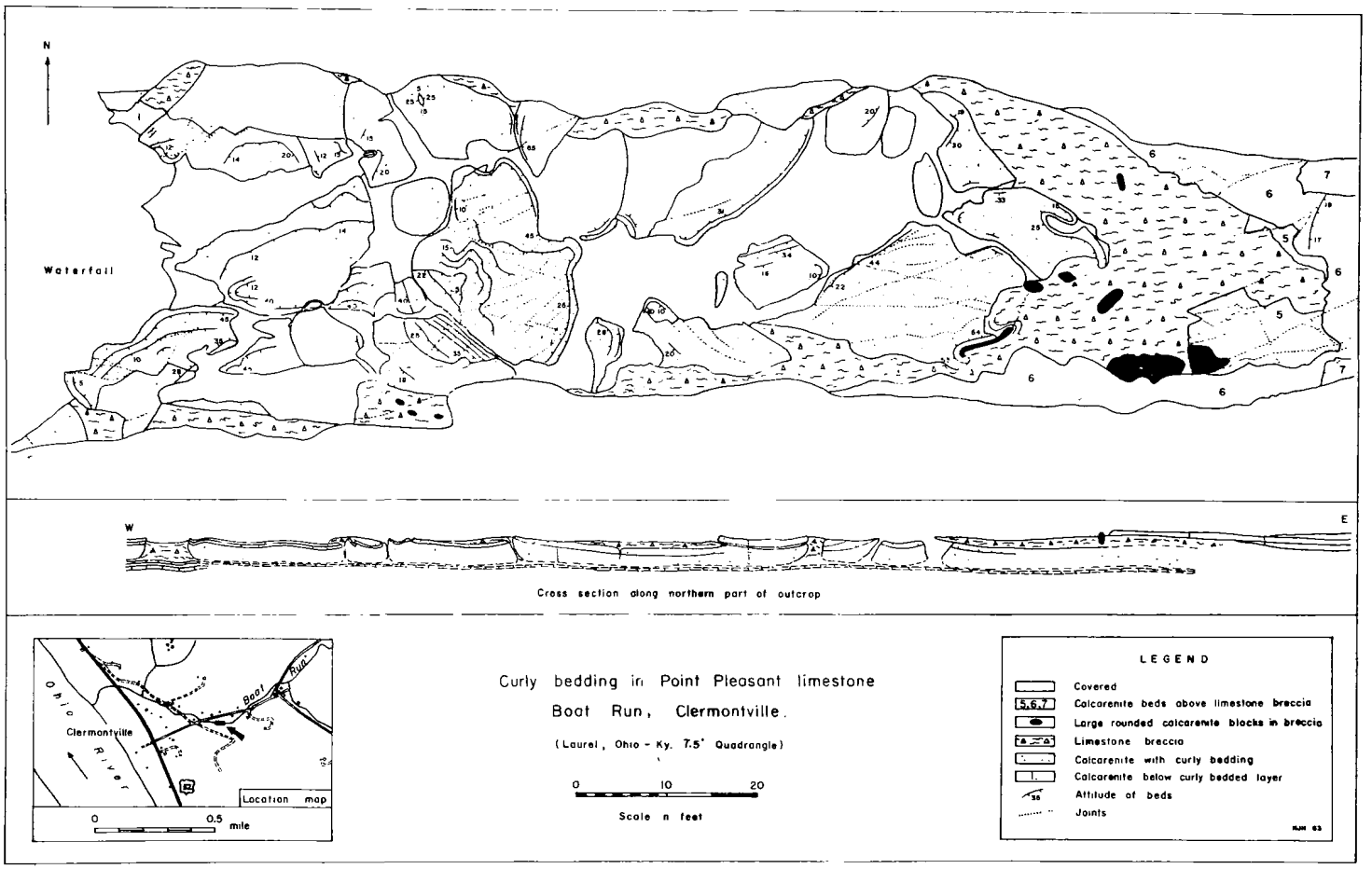

N
Waterfall
W
E
Cross section along northern part of outcrop
Ohio River
Clermontville
Boat Run
Location map
0
0.5
mile
Curly bedding in Point Pleasant limestone
Boat Run, Clermontville.
(Laurel, Ohio - Ky. 7.5' Quadrangle)
0
10
20
Scale in feet
LEGEND
Covered
5,6,7
Calcarenite beds above limestone breccia
Large rounded calcarenite blocks in breccia
Limestone breccia
Calcarenite with curly bedding
Calcarenite below curly bedded layer
Attitude of beds
Joints

Figure 9

The sub-Eden beds of the Cincinnati region have been a vexing problem since the turn of the century. In 1906 the Cynthiana formation was described and named by Foerste. Exact relationships of the various members of the formation with overlying Eden and underlying Trenton beds is still uncertain. The Point Pleasant member here directly underlies the Fulton member of the Eden shale. The distortions observable in the calcarenite bed at Boat Run have been mapped in detail by H. J. Hofmann and are reproduced here as Figure 9.

The trip ends here. We hope you have enjoyed this survey of old Cincinnatian localities and wish you a safe trip home.

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Since completion of the guide for the 1970 geology field trip, several changes have had to be made. One route change is necessary because of a bridge out, probably because of the recent rains. A second is simply the substitution of a better locality for one of the stops.

Stop 1 has been eliminated. The route from Fort Ancient will be the same as far as Oregonia, where, instead of going through town and crossing the railroad and river, we will turn right on Olive Branch Road (Figure 7, inset) and proceed directly to Stop 2.

From Stop 2 we will go south on Murray Road, east on Wilmington Road across the Silurian outlier, southeast on Clarksville Road to Route 22. Now, instead of taking 22 to the right, continue across 22 (Clarksville Quadrangle). At about 1.4 miles turn left on SR 350 and drive through Clarksville to the intersection with Route 730 at Villars Chapel, a distance of about 4.3 miles. Turn left on 730 and proceed about 0.8 mile across spillway at Cowan Lake dam, to parking area. This unnumbered stop is an excellent exposure of richly fossiliferous Liberty and Waynesville beds. The stop will be for about 45 minutes.

Turn around and drive west along Routes 730 and 350 to Middleboro Road, where we rejoin the guidebook route, turning south to Stop 3 (bottom of guidebook page 13).

After Stop 3 it is necessary to revise the route a bit because of a bridge out. At Route 22 turn right (west). Go 1.4 miles and turn left (south) on Osceola-Roachester Road (sign pointing to Rocknoll Nurseries), cross Todd Fork and on to Route 132. Turn southwest on Route 132, rejoining the guidebook route again at mileage 18.2 of guidebook. Next stop is Stop 4, at bridge over Second Creek. Hereafter, barring further troubles caused by floods or the highway department, we follow the guidebook itinerary.

The Committee thanks Mr. Thomas Weaver of Cincinnati for his help in making these last minute revisions.